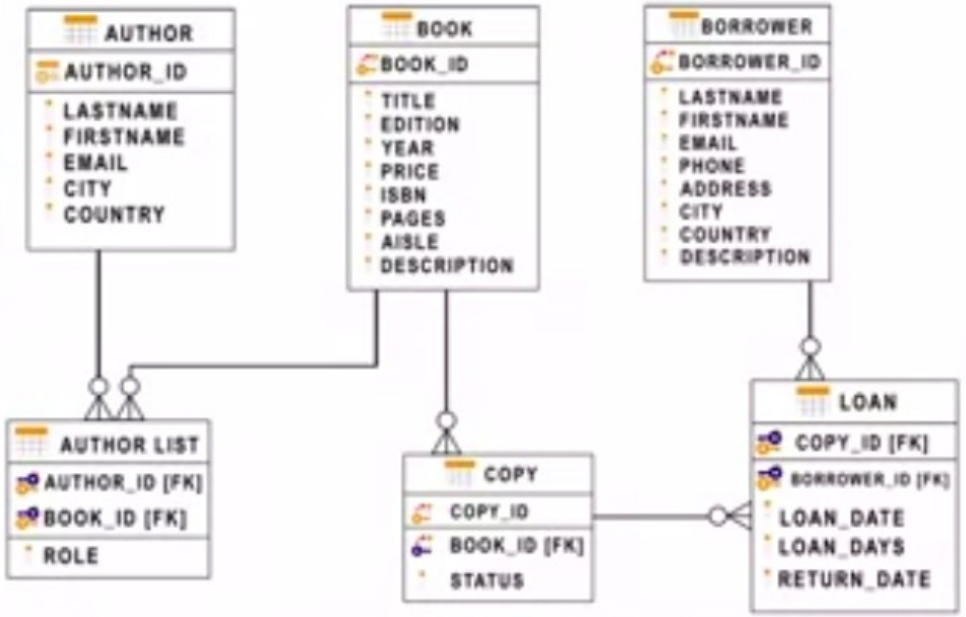
Week 2

Relational Database Concepts

Relational Model

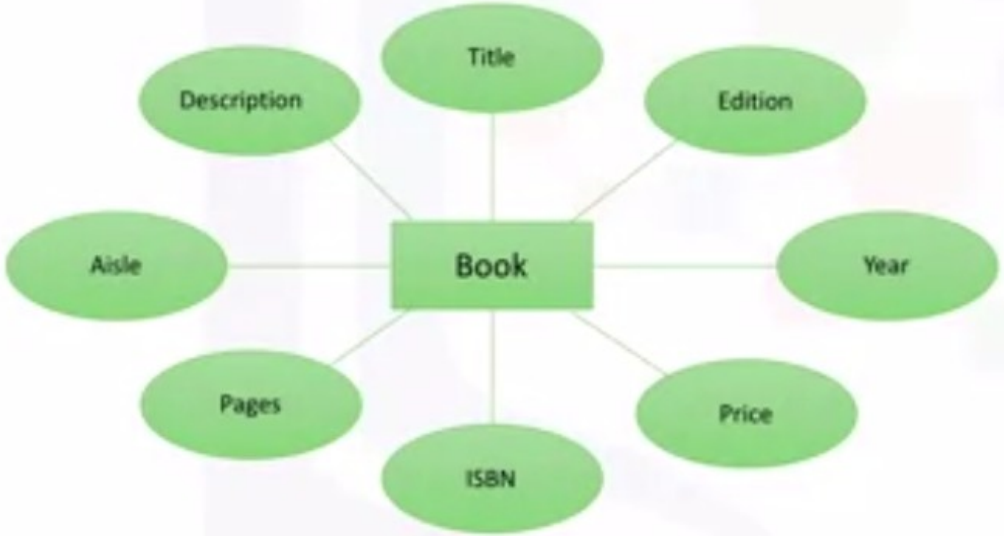
- Most used data model
- Allows for data independence
- Data is stored in a tables



logical data independence - physical data independence - physical storage independence

Entity-Relationship Model

- Used as a tool to design relational databases



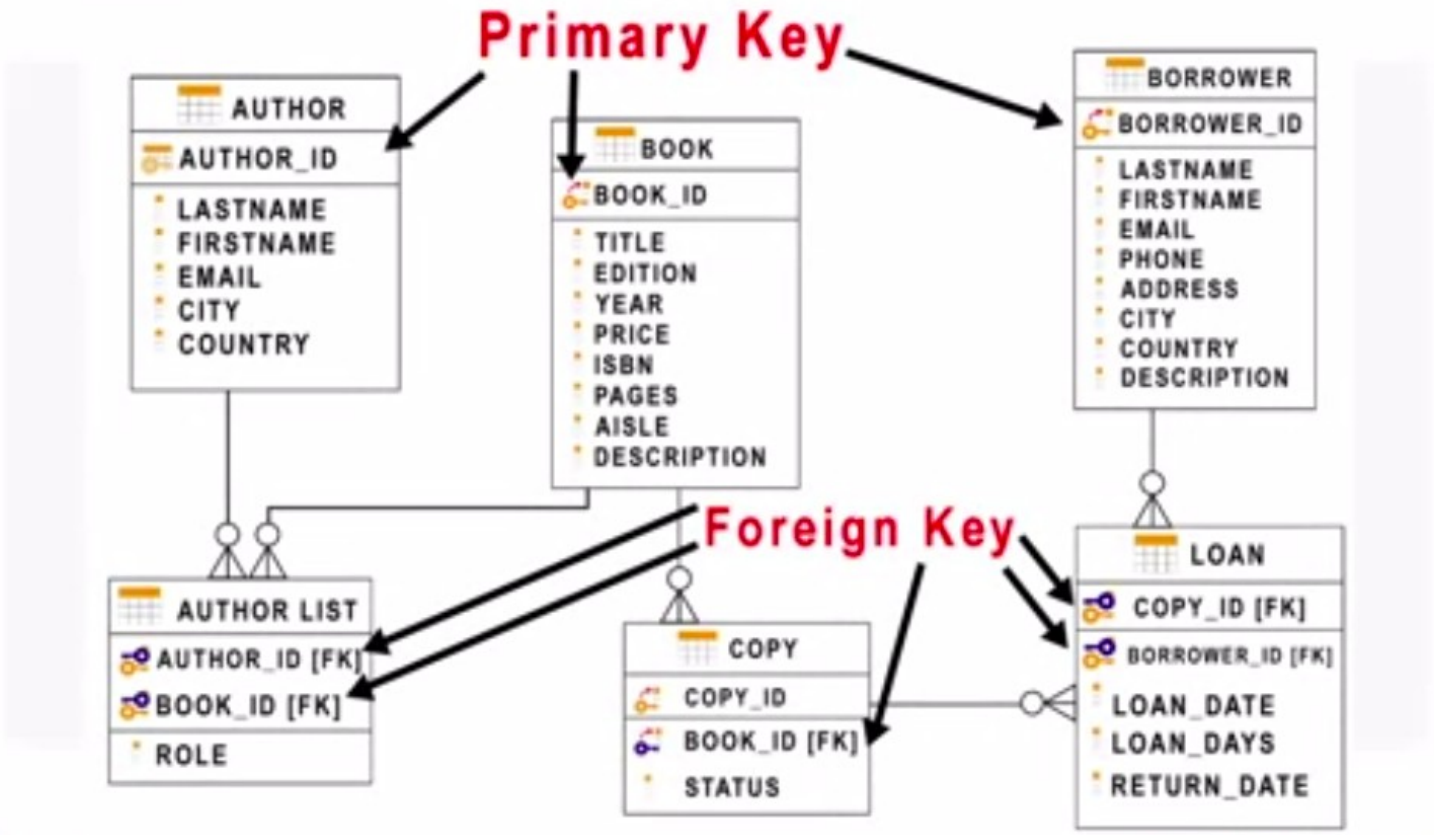
Mapping Entity Diagrams to Tables

- Entities become tables
- Attributes get translated into columns

Table: Book

Title	Edition	Year	Price	ISBN	Pages	Aisle	Description
Database Fundamentals	1	2010	24.99	978-0-98662 83-1-1	300	DB-A02	Teaches you the fundamentals of databases
Getting started with DB2 Express-C	1	2010	24.99	978-0-9866 283-5-1	280	DB-A01	Teaches you the essentials of DB2 using DB2 Express-C, the free version of DB2

Primary Keys and Foreign Keys



Summary

Now you know:

- The key advantage of the relational model is data independence
- Entities are independent objects which have Attributes
- Entities map to Tables in a Relational Database
- Attributes map to Columns in a Table
- Common data types include characters, numbers, and dates/times
- A Primary Key uniquely identifies a specific row in a table

How to create a Database instance on cloud

In this video...

- Cloud Database Basics
- List some Cloud Databases
- Describe a Database Instance
- Create an instance of IBM Db2 on Cloud

Cloud databases

- ✓ Ease of Use and Access
  - API
  - Web Interface
  - Cloud or Remote Applications
- ✓ Scalability & Economics
  - Expand/Shrink Storage & Compute Resources
  - Pay per use
- ✓ Disaster Recovery
  - Cloud Backups and Geographical Distribution

Examples of Cloud databases

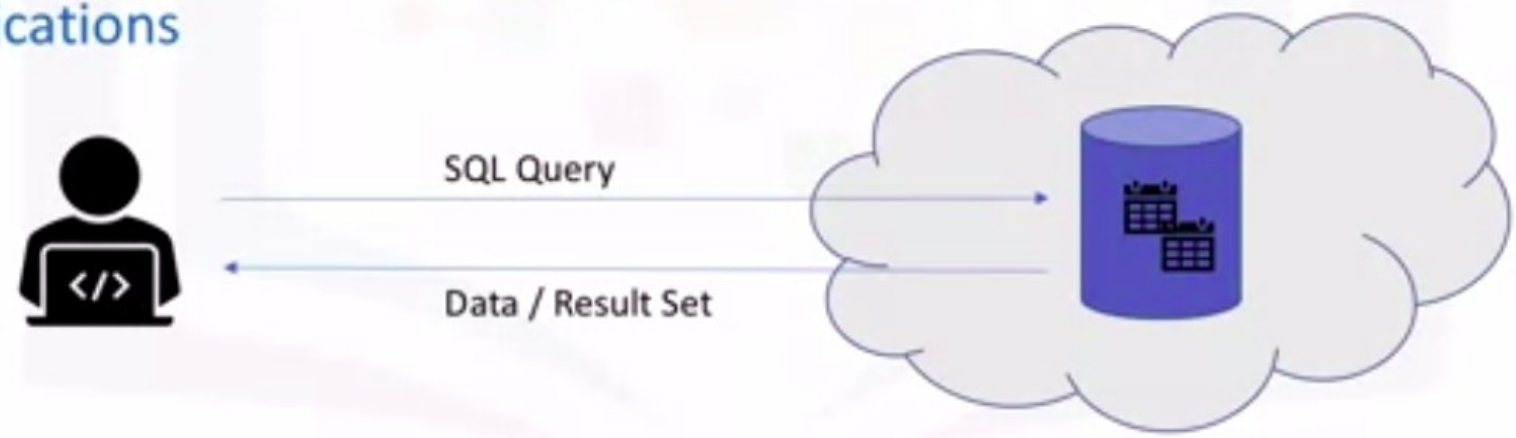
- IBM Db2
- Databases for PostgreSQL
- Oracle Database Cloud Service
- Microsoft Azure SQL Database
- Amazon Relational Database Services (RDS)

Available as:

- VMs or Managed Service
- Single or Multi-tenant

Database service instances

- DBaaS provides users with access to Database resources in cloud without setting up hardware and installing software.
- Database service instance holds data in data objects / tables
- Once data is loaded, it can be queried using web interfaces and applications



Creating a database instance on IBM Db2 on Cloud

IBM Db2 on Cloud

Question

What are the advantages of using cloud databases

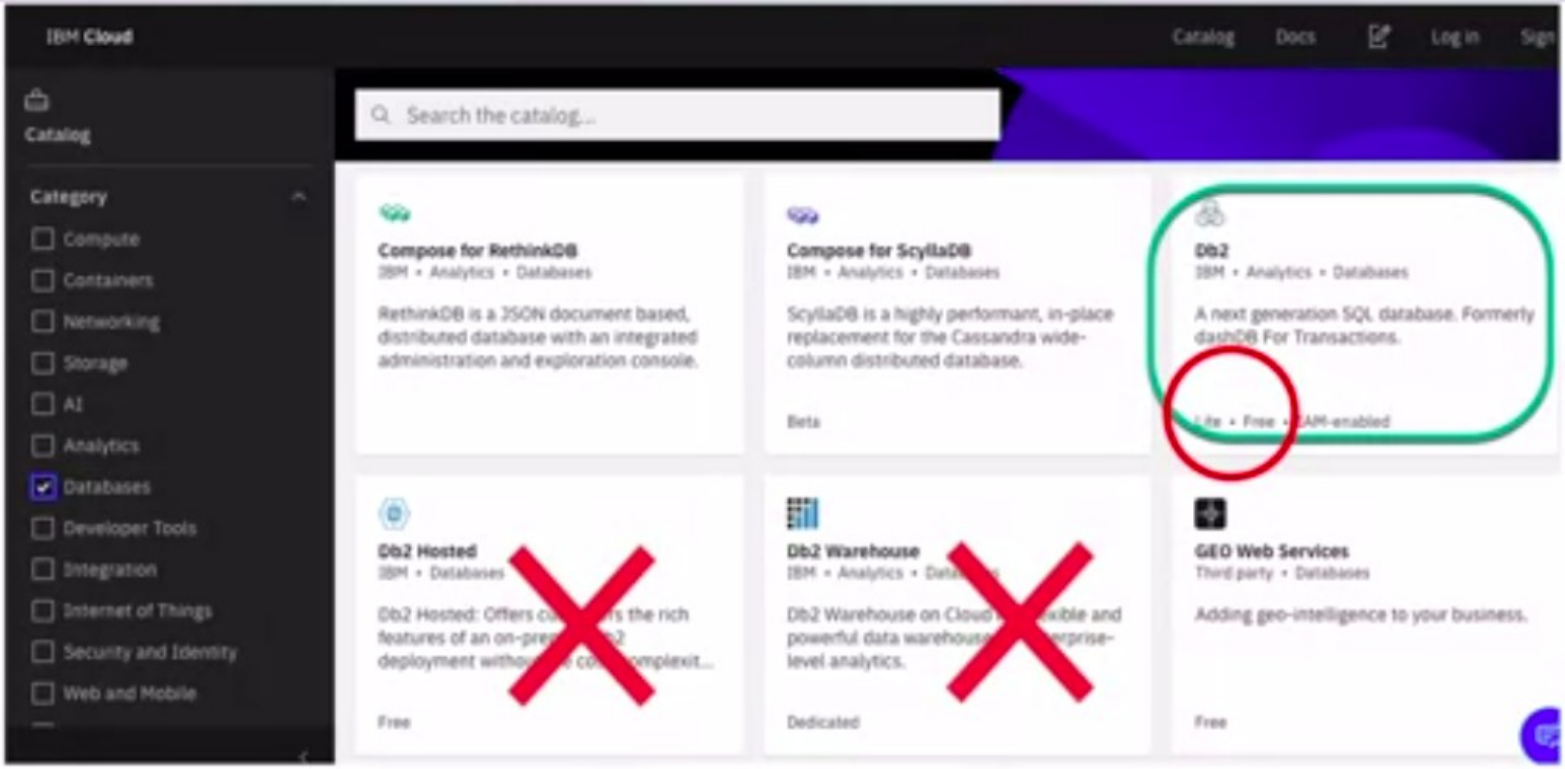
- ○ Ease of Use and Management
- ○ Scalability
- ○ Disaster Recovery
- ◉ All of the above

Correct

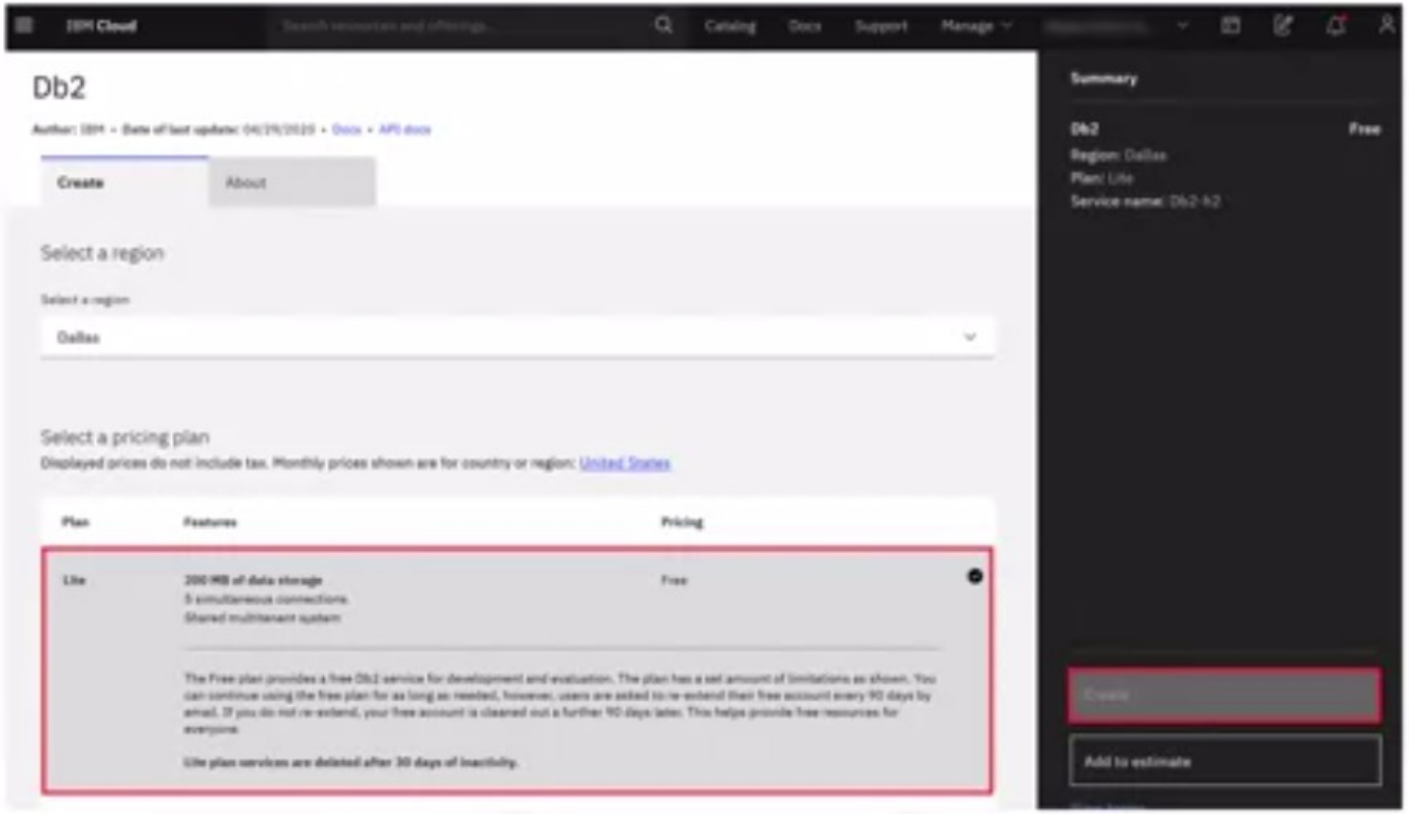
Correct! All of the above are advantages of using cloud databases. Cost and paying for only the resources you utilize may be another advantage.

Skip Continue

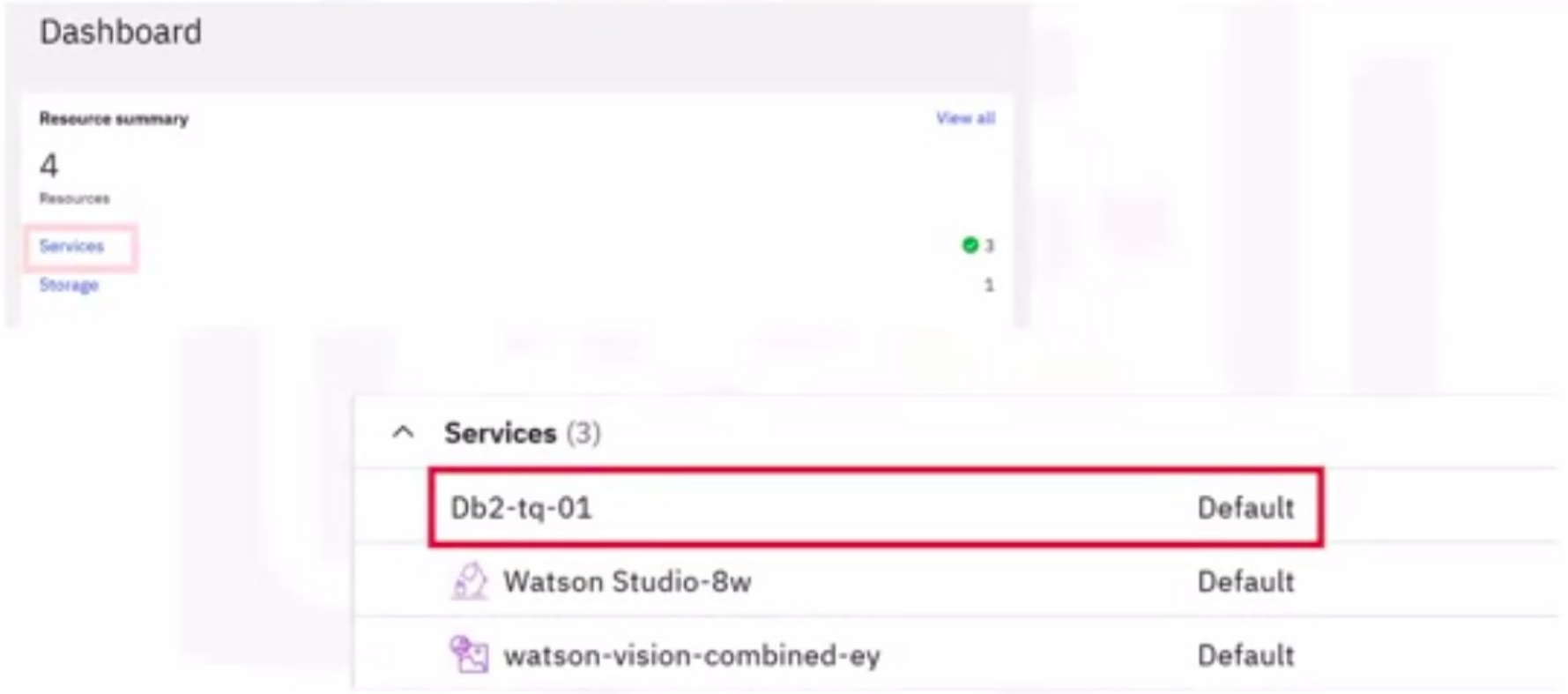
Deploy an instance of Db2 on Cloud Service



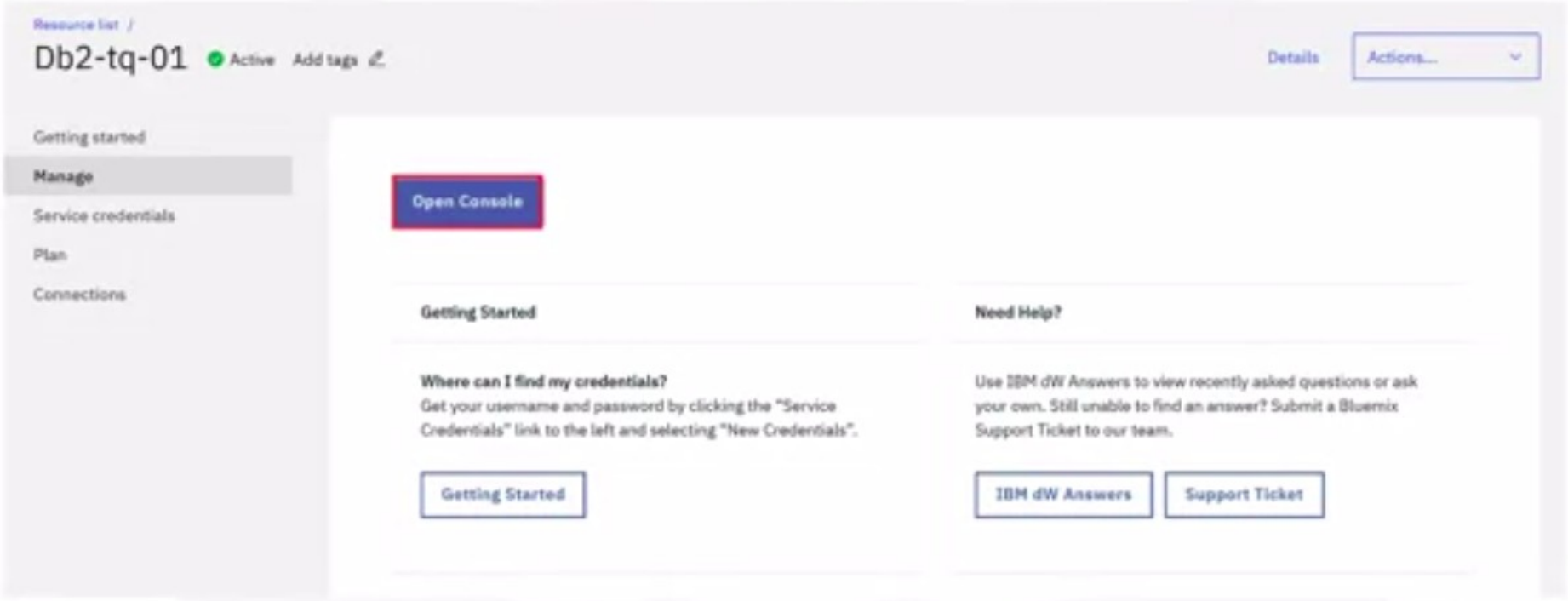
Create a new service



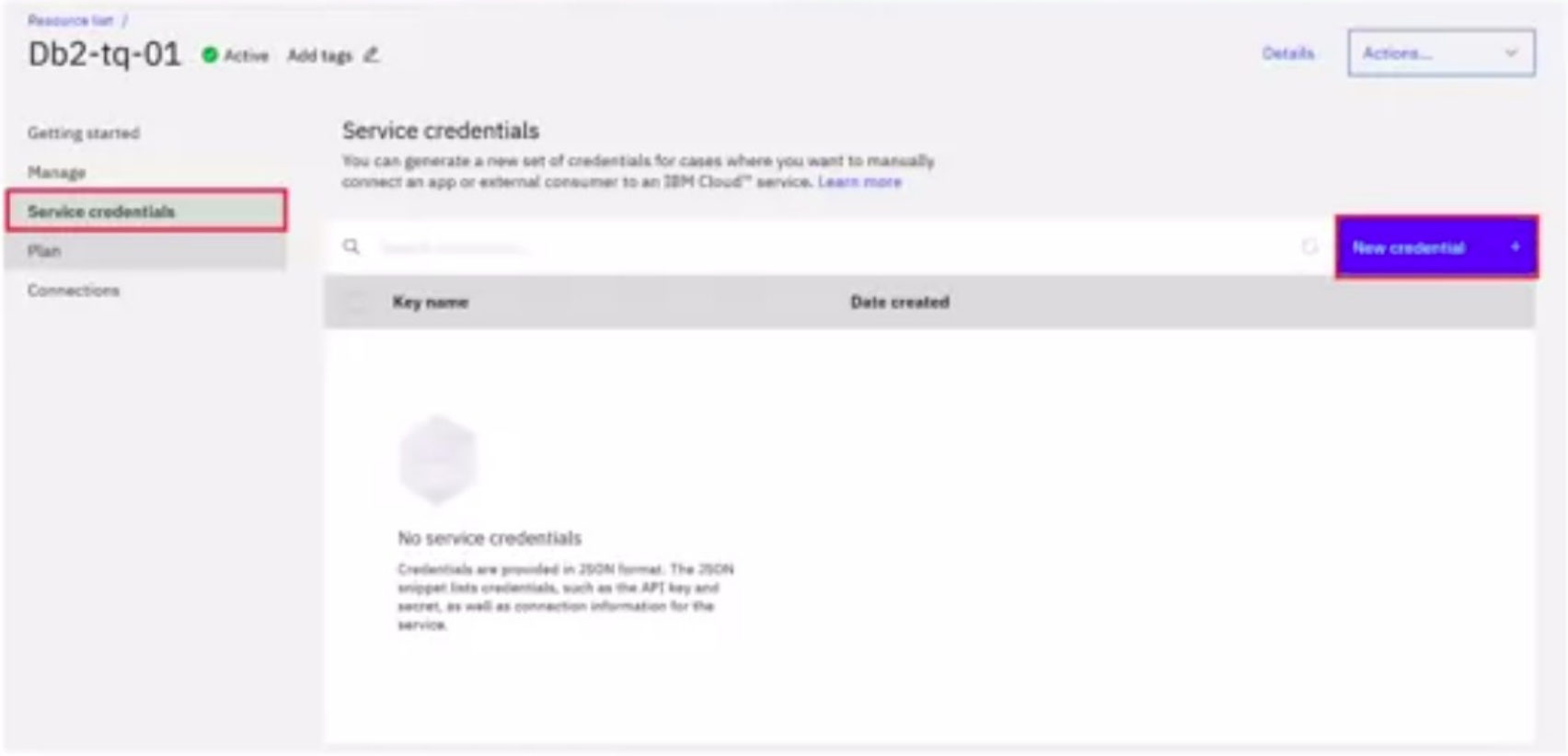
View the newly created service



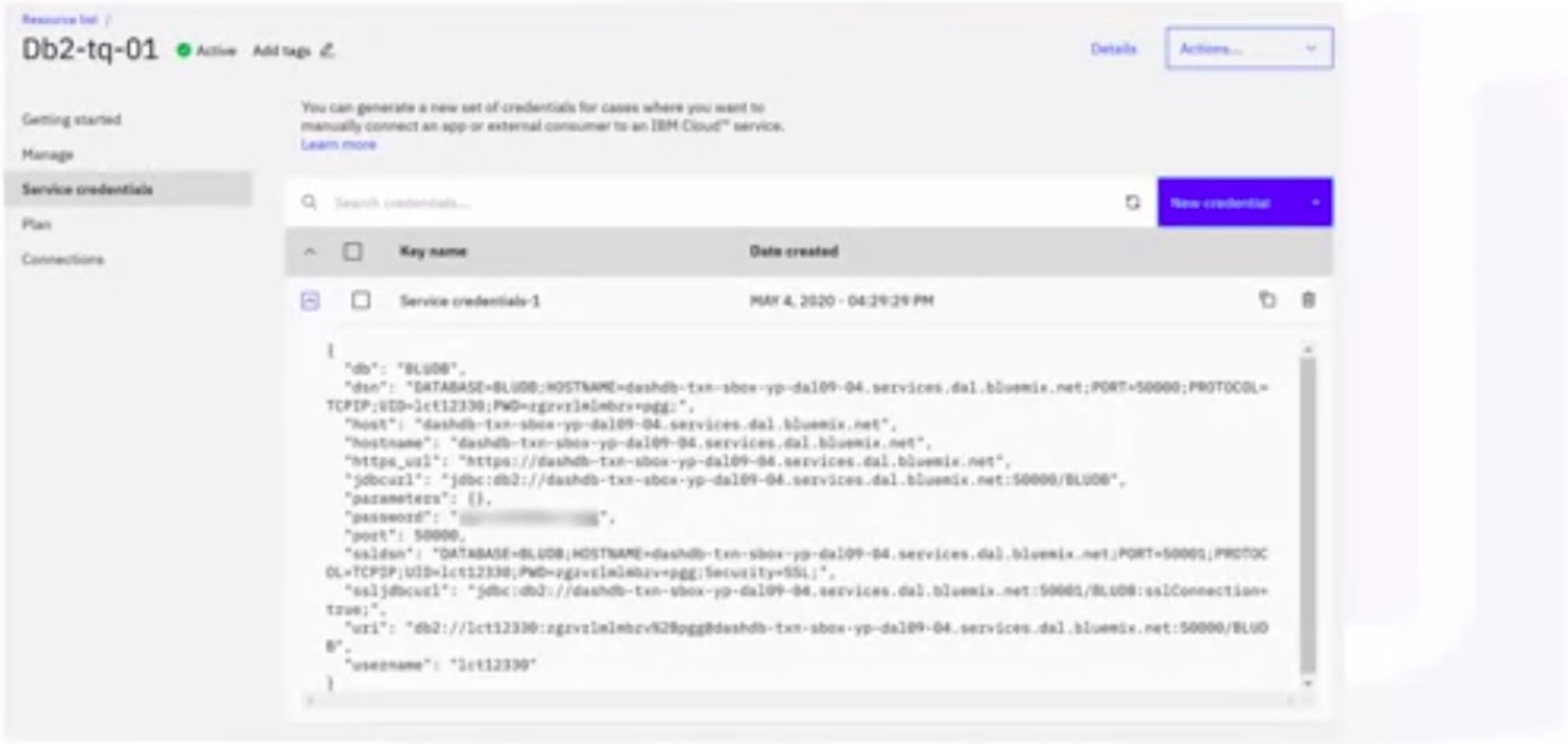
Manage the database instance



Create new service credentials



Service credentials



Service credentials

Key name	Date created
Service credentials-1	MAY 4, 2020 - 04:29:29 PM


```
{
  "db": "BLUDB",
  "dsn": "DATABASE=BLUDB;HOSTNAME=dashdb-txn-sbox-yp-dal09-04.services.dal.bluemix.net;PORT=50000;PROTOCOL=
TCPIP;UID=lct12330;PWD=zgzvrlmlmbzv+pgg;",
  "host": "dashdb-txn-sbox-yp-dal09-04.services.dal.bluemix.net",
  "hostname": "dashdb-txn-sbox-yp-dal09-04.services.dal.bluemix.net",
  "https_url": "https://dashdb-txn-sbox-yp-dal09-04.services.dal.bluemix.net",
  "jdbcurl": "jdbc:db2://dashdb-txn-sbox-yp-dal09-04.services.dal.bluemix.net:50000/BLUDB",
  "parameters": {},
  "password": "[redacted]",
  "port": 50000,
  "ssldsn": "DATABASE=BLUDB;HOSTNAME=dashdb-txn-sbox-yp-dal09-04.services.dal.bluemix.net;PORT=50001;PROTOC
OL=TCPIP;UID=lct12330;PWD=zgzvrlmlmbzv+pgg;Security=SSL;",
  "ssljdbcurl": "jdbc:db2://dashdb-txn-sbox-yp-dal09-04.services.dal.bluemix.net:50001/BLUDB:sslConnection=
true;",
  "uri": "db2://lct12330:zgzvrlmlmbzv%2Bpgg@dashdb-txn-sbox-yp-dal09-04.services.dal.bluemix.net:50000/BLUD
B",
  "username": "lct12330"
}
```

Types of SQL statements

DDL vs. DML

Objectives

At the end of this video, you will be able to:

- Distinguish between Data Definition Language statements and Data Manipulation Language statements

Types of SQL Statements - DDL

- SQL Statement types: DDL and DML
- DDL (Data Definition Language) statements:
  - Define, change, or drop data
- Common DDL:
  - CREATE
  - ALTER
  - TRUNCATE
  - DROP

Types of SQL Statements - DML

- DML (Data Manipulation Language) statements:
  - Read and modify data
  - CRUD operations (Create, Read, Update & Delete rows)

- Common DML:
  - INSERT
  - SELECT
  - UPDATE
  - DELETE

Summary

Now you know that:

- DDL used for defining objects (tables)
- DML used for manipulating data in tables

CREATE TABLE Statement

Objectives

At the end of this video, you will be able to:

- Create a Table in a relational database using Entity Name, Attributes and the CREATE TABLE statement

CREATE table

- **Syntax:**

```
CREATE TABLE table_name
   (
    column_name_1 datatype optional_parameters,
    column_name_2 datatype,
    …
    column_name_n datatype
   )
```

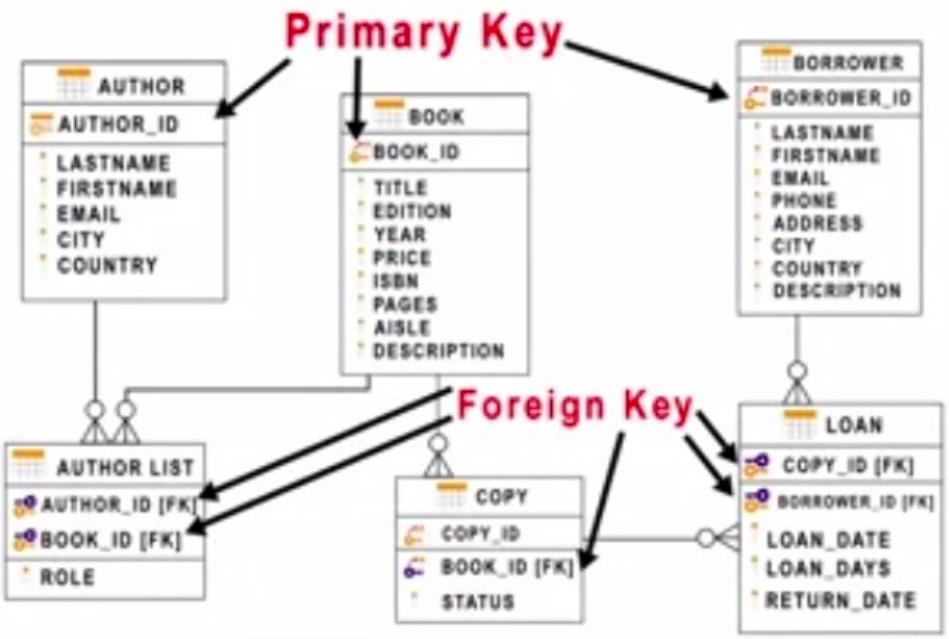
EXAMPLE

- Create a table for Canadian provinces

```
CREATE TABLE provinces(
    id char(2) PRIMARY KEY NOT NULL,
    name varchar(24)
   )
```

id *char(2)*	name *varchar(24)*
AB	ALBERTA
BC	BRITISH COLUMBIA
...	...

Create a table



Primary Key: Uniquely Identifies each Row in a Table

CREATE TABLE Statement

To create the Author table, use the following columns and datatypes:

AUTHOR(Author_ID:char, Lastname:varchar, Firstname:varchar, Email:varchar, City:varchar, Country:char)

```
CREATE TABLE author (
    author_id CHAR(2) PRIMARY KEY NOT NULL,
    lastname VARCHAR(15) NOT NULL,
    firstname VARCHAR(15) NOT NULL,
    email VARCHAR(40),
    city VARCHAR(15),
    country CHAR(2)
  )
```

CREATE TABLE Statement

To create the Author table, use the following columns and datatypes:

AUTHOR(Author_ID:char, Lastname:varchar, Firstname:varchar, Email:varchar, City:varchar, Country:char)

```
CREATE TABLE author (
    author_id CHAR(2) PRIMARY KEY NOT NULL,
    lastname VARCHAR(15) NOT NULL,
    firstname VARCHAR(15) NOT NULL,
    email VARCHAR(40),
    city VARCHAR(15),
    country CHAR(2)
  )
```

Summary

Now you know that:

- CREATE used for creating entities (tables) in a relational database
- CREATE TABLE statement includes definition of attributes (columns):
  - Names of columns
  - Datatypes of columns
  - Constraints (e.g. Primary Key)

ALTER, DROP, and TRUNCATE Tables

Objectives

After watching this video, you will be able to:

- Describe the ALTER TABLE, DROP TABLE, and TRUNCATE statements
- Explain the syntax
- Use the statement in queries

ALTER TABLE ... ADD COLUMN

- Add or remove columns
- Modify the data type of columns
- Add or remove keys
- Add or remove constraints

```
ALTER TABLE <table_name>
  ADD COLUMN <column_name_1> datatype
  . . .
  ADD COLUMN <column_name_n> datatype;
```

ALTER TABLE ... ADD COLUMN

```
ALTER TABLE author
  ADD COLUMN telephone_number BIGINT;
```

author_id	lastname	firstname	email	city	country	telephone_number
1001	Thomas	John	johnt@...	New York	USA	5551111
1002	James	Alice	alicej@...	Seattle	USA	5551112
1003	Wells	Steve	stevew:@...	Montreal	Canada	5552222
1004	Kumar	Santosh	kumars@...	London	UK	5553333

ALTER TABLE ... ALTER COLUMN

```
ALTER TABLE author
  ALTER COLUMN telephone_number SET DATA TYPE
CHAR(20);
```

author_id	lastname	firstname	email	city	country	telephone_number
1001	Thomas	John	johnt@...	New York	USA	555-1111
1002	James	Alice	alicej@...	Seattle	USA	555-1112
1003	Wells	Steve	stevew@...	Montreal	Canada	555-2222
1004	Kumar	Santosh	kumars@...	London	UK	555-3333

ALTER TABLE ... DROP COLUMN

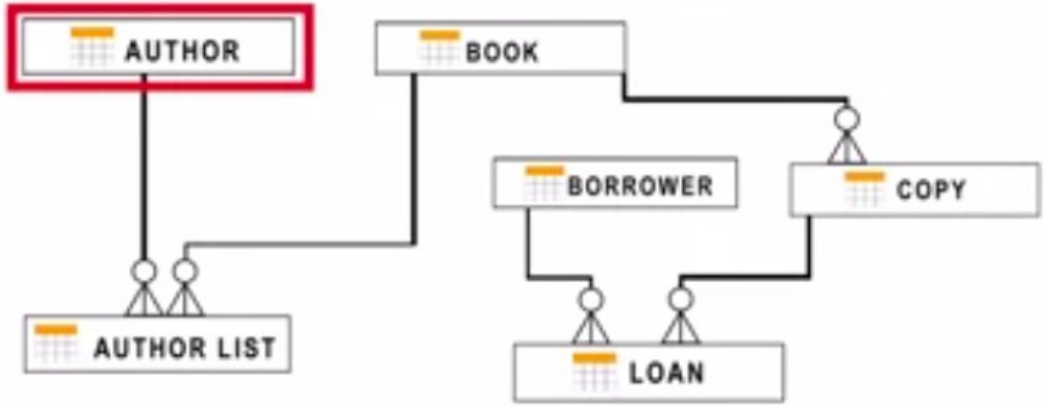
```
ALTER TABLE author
   DROP COLUMN telephone_number;
```

author_id	lastname	firstname	email	city	country
1001	Thomas	John	johnt@...	New York	USA
1002	James	Alice	alicej@...	Seattle	USA
1003	Wells	Steve	stevew:@...	Montreal	Canada
1004	Kumar	Santosh	kumars@...	London	UK

DROP TABLE

```
DROP TABLE <table_name>;
```

```
DROP TABLE author;
```



TRUNCATE TABLE

```
TRUNCATE TABLE author
  IMMEDIATE;
```

author_id	lastname	firstname	email	city	country

Summary

In this video, you learned that:

- The ALTER TABLE statement changes the structure of an existing table, for example to add, modify, or drop columns
- The DROP TABLE statement deletes an existing table
- The TRUNCATE TABLE statement deletes all rows of data in a table

Summary & Highlights

Congratulations! You have completed this lesson. At this point in the course, you know:

- A database is a repository of data that provides functionality for adding, modifying, and querying the data.
- SQL is a language used to query or retrieve data from a relational database.
- The Relational Model is the most used data model for databases because it allows for data independence.
- The primary key of a relational table uniquely identifies each tuple or row, preventing duplication of data and providing a way of defining relationships between tables.
- SQL statements fall into two different categories: Data Definition Language (DDL) statements and Data Manipulation Language (DML) statements.

Completed

Go to next item

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Practice Quiz

Practice Quiz • 15 min • 5 total points

Due Apr 2, 11:59 PM IST

1. What is the function of a primary key? **1 / 1 point**

- ○ The primary key is used to grant access to a table.
- ◉ The primary key uniquely identifies each row in a table.
- ○ The primary key enables you to add data to columns.
- ○ The primary key is used to identify any rows in the table that contain NULL values.

Correct

Correct. The primary key uniquely identifies each row in a table.

2. True or False: Data Manipulation Language statements like INSERT, SELECT, UPDATE, and DELETE are used to read and modify data. **1 / 1 point**

- ◉ True
- ○ False

Correct

Correct. Data Manipulation Language statements like INSERT, SELECT, UPDATE, and DELETE are used to read and modify data.

- ○ False

Correct
Correct. Data Manipulation Language statements like INSERT, SELECT, UPDATE, and DELETE are used to read and modify data.

3. Data Definition Language (or DDL) statements are used to define, change, or delete database objects such as tables. Which of the following statements are all DDL statements? **1 / 1 point**

- ○ SELECT and DELETE
- ◉ CREATE, ALTER, DROP
- ○ INSERT and UPDATE
- ○ SELECT, INSERT, UPDATE

Correct
Correct. The CREATE, ALTER, and DROP statements act on objects such as tables, not the data within the table.

4. Which of the following queries will change the data type of an existing column (phone) to the varchar data type? **1 / 1 point**

- ◉ ALTER TABLE author ALTER COLUMN phone SET DATA TYPE VARCHAR(20);

4. Which of the following queries will change the data type of an existing column (phone) to the varchar data type? **1 / 1 point**

- (●) ALTER TABLE author ALTER COLUMN phone SET DATA TYPE VARCHAR(20);
- ( ) ALTER COLUMN phone SET DATA TYPE VARCHAR(20);
- ( ) ALTER TABLE author ALTER COLUMN phone SET TYPE VARCHAR(20);
- ( ) ALTER TABLE author ALTER COLUMN phone DATA TYPE = VARCHAR(20);

Correct
Correct. This query will change the data type to varchar.

5. The five basic SQL commands are: **1 / 1 point**

- ( ) SELECT, COPY, PASTE, INSERT, ALTER
- ( ) None of the above
- (●) CREATE, SELECT, INSERT, UPDATE, DELETE
- ( ) CREATE, INSERT, RETRIEVE, MODIFY, DELETE

Correct
Correct. The five basic SQL commands are CREATE, SELECT, INSERT, UPDATE, and DELETE.

Back

Graded Quiz: Relational DB Concepts and Tables

Graded Quiz • 9 min

Due Apr 2, 11:59 PM IST

1. Which of the following statements about a database is/are correct?

1 / 1 point

- (●) A database is a logically coherent collection of data with some inherent meaning
- ( ) Data can only be added and queried from a database, but not modified.
- ( ) Only SQL can be used to query data in a database.
- ( ) All of the above

Correct

Correct. A database is a repository or logically coherent collection of data with some inherent meaning

2. Attributes of an entity become _____ in a table.

1 / 1 point

- ( ) rows
- (●) columns
- ( ) constraints
- ( ) keys

Correct

Correct. Attributes of an entity become columns in a table.

2. Attributes of an entity become _____ in a table. 1 / 1 point

- rows
- (•) columns
- constraints
- keys

Correct
Correct. Attributes of an entity become columns in a table.

3. The CREATE TABLE statement is a.... 1 / 1 point

- DML statement
- (•) DDL statement
- Both of the above

Correct
Correct. The CREATE TABLE statement defines a table, so it is a DDL statement.